University of Applied Sciences and Arts Northwestern Switzerland
School of Business

Where to publish?

Development of a recommender system for academic publishing

Thesis
Master of Science in Business Information Systems

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Date: February 2014

Abstract

This thesis using the method of research design is about creating a journal recommendation system for authors. Existing systems like JANE or whichjournal.com offer recommendations based on similarities of the content. This study invests how more sophisticated factors like openness, price (subscription or article processing charge), speed of publication can be included in the ranking of a recommendation system. The recommendation should also consider the expectations from other stakeholders like libraries or funders.

I confirm that this master thesis research was performed autonomously by myself using only the sources, aids and assistance stated in the report, and that quotes are readily identifiable as such.

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28.2.2014, Christian Gutknecht

Content

1 Introduction

1.1 Background

It is some kind of ironic situation that the World Wide Web has yet not enfolded its true potential in exactly the area of scientific communication, for which Tim Berners-Lee originally invented the web more than twenty years ago at CERN. Even though the web offers technically the chance to easily distribute scientific information to society at almost no cost, the access to this information is still today in many cases restricted.

The intention to remove these restrictions has been declared and (re)affirmed by many organizations and individuals worldwide over the last twenty years. One of the most prominent examples is the *Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities*[1] from 2003, which has been signed by more than 400 research institutions. It's a very short and precise declaration that promotes open access to scientific research results such as research papers or raw data.

Despite a steady grow of the open access (OA) movement in the last ten years the majority of research results still is not freely available. In academic journal publishing the traditional subscription model, where the reader is charged is still predominant. In 2011 only 17% of 1.66 millions scholarly articles, were published directly with so called open access publisher, where there is no charge to the reader (Laakso & Björk, 2012).

There are indeed many reasons why OA hasn't yet taken off completely. One of the most obvious ones is that a few international publishers dominate the market of academic publishing and by doing so benefit of the status quo. For example, in 2012 the publisher Elsevier, who has 2500 academic journals in his portfolio had an adjusted operating profit of 780 millions GBP and an adjusted operating margin of 37.8% (Elsevier, 2012, p. 15). These profit-oriented companies have no interest to switch to OA, as long there is no pressure from the market.

The market itself is segregated and not transparent. Authors who publish and contribute in peer reviewing with traditional publishers do that for free and they usually have no detailed idea about the involved costs or the final price the publishers will be selling the author's content. This is because the publisher sell the content to a different community, namely to libraries. This segregation and thus

[1] http://oa.mpg.de/lang/en-uk/berlin-prozess/berliner-erklarung/

lack of information weakens the common position of authors as readers and libraries to enforce OA.

Additionally there exists hardly any transparency about prices. Because it's still common practice, that libraries and library consortia pay for bundles of journals and often sign non-disclosure agreements about the conditions of their subscription prices (see Bergstrom, Courant, & McAfee, 2009).

Many research funders and universities have recognized the importance of OA and have created recommendations and policies. But it turns out that unless the compliance of these policies is monitored and ensured, they are rather ineffective (Richard Poynder, 2012; Swan, 2012, sec. 8.2.1). In academia force is in general not popular (Rieble, 2009) and therefore enforcement of OA by is rather regarded as a last resort. Nevertheless the pressure on researcher to comply with funders and institute policies is rising. The US National Institutes of Health (NIH) and the Wellcome Trust, UK have announced recently that they will withhold grant money in case of noncompliance (Jha, 2012; Matthews, 2013).

1.2 Motivation

This research is motivated by providing an alternative approach to get to more open access by offering authors journal recommendations. Studies show (Dallmeier-Tiessen et al., 2011) that a clear majority of researchers think that OA is beneficial for their research fields, but only a minority really considers OA as hard criteria when they publish. Obviously there are other interests involved when researchers select a journal to submit a paper. Identifying these interests and in case of conflicting interests to offer a resolution could be a key component to more open access very quickly.

2 Literature Review

This chapter gives a short review about related works.

The first part will focus on existing services, which support the decision, where to publish. Services as found running on the Internet were analyzed for their functionalities. What is requested as input? What options does the user have to influence the output? Of particular interest was the way OA is implemented.

The second part contains an overview about what is known in the literature about the selection criteria for journals. What's important for researcher when they are looking for a journal to submit a paper? And how does OA come into that decision.

2.1 Recommender Services: Where to publish

A service helping authors of scientific papers to select journals to which to submit their manuscripts was firstly described in a paper with the title "Matching authors and readers of scientific papers" by Kochen & Tagliacozzo (1974). It proposed a service to:

> "provide the author with a table, giving for each journal the size of its readership, its editorial objectives and policies, its acceptance rate, its publication lag, the fraction of its articles which are significant, and other pertinent information. Such a table may give the author more guidance than would otherwise be available to him on the journals eligible to publish his article."

Such a service would depend on:

> "(1) reliable knowledge of what variables to elicit from the author and what variables describing journals to supply him or his counselor;
>
> (2) a good decision procedure for recommending an optimal choice of journal and a longer-range publication strategy to the author."

Kochen & Tagliacozzo (1974) then provide a mathematical model to calculate the relevance, acceptance rate, circulation, prestige, and publication lag of a journal.

While it's not explicitly stated in the article, the service was probably envisaged as a mix between human, calculator and paper:

> "Implementation of such a service could be started by the librarian or information specialist of a research institute, who would initiate the compiling of data about journals in which the researchers of that institution are most likely to publish. He or she then would present this information to the authors and elicit from them the judgments needed to compute the measures proposed here. Success could lead to explicit demand and to expansion of the service."

Despite this remarkable and early idea to create a service for journal recommendations, no reference could be found that the proposed service ever was realized or even tested.

Further approaches that aim to assist the author by choosing a journal to submit seem to come from a different angle without making a link to Kochen & Tagliacozzo.

2.1.1 Journal Finder of Research Gate

In 2009, Research Gate a social community platform for scientists announced a new feature called *Journal Finder* (ResearchGate, 2009). With the entry of an abstract it will list various journals, which should match to the abstract (see Figure 1). How the matching is done exactly is not documented and therefore unclear. However there seems to be a journal database of around 20'000 journals, containing information like description, keywords about the journal and abstracts of individual papers. So one can assume that keywords from the entered abstracts are extracted and a search is performed in that journal database.

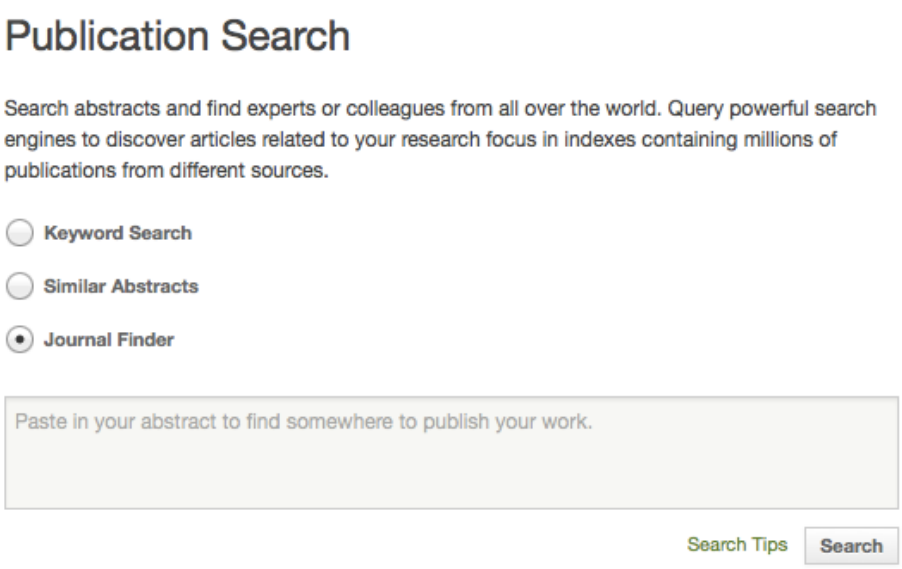

Figure 1: Screenshot of the ResearchGate Journal Finder (Accessed July 2013)

2.1.2 Elsevier Journal Finder

Elsevier offer a journal finder (as beta), but only for its own journals (http://journalfinder.elsevier.com/):

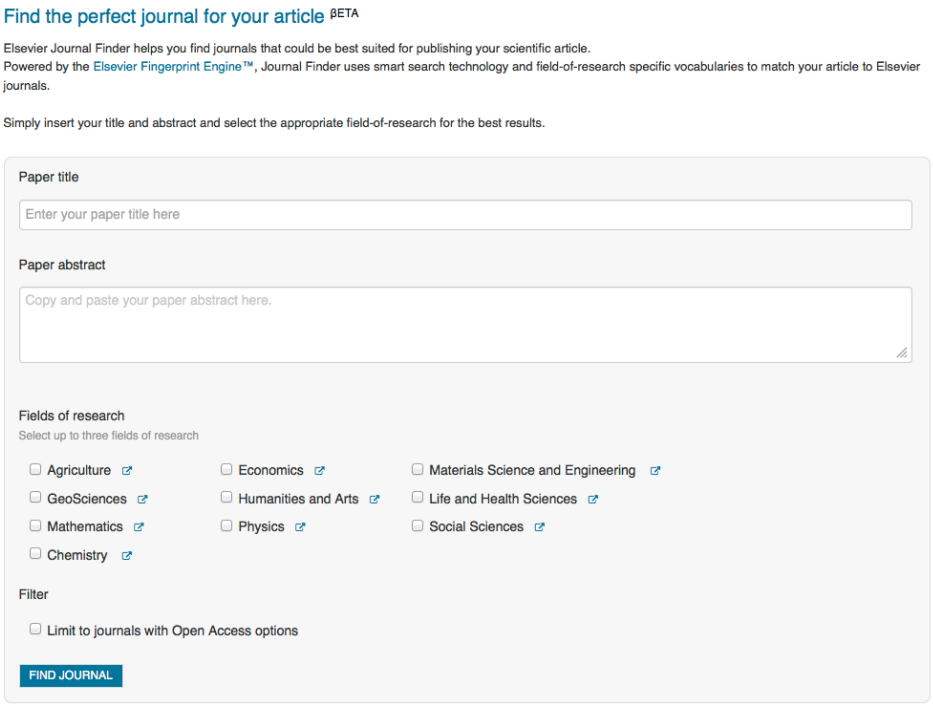

Figure 2: Elsevier Journal Finder (Accessed Februar 2014)

2.1.3 Jane (Journal/Author Name Estimator)

Jane (http://biosemantics.org/jane/, see Figure 3) is a freely available web-based application that, on the basis of an abstract or title can suggest journals and experts who have published similar articles. The way how Jane works is described by Schuemie & Kors (2008). Data is collected from Medline, the journal citation database of the US National Library of Medicine. In 2008, it contained around 4.17 million articles from 4513 active journals. Ever since the data source is updated monthly. Jane first searches for the 50 articles that are most similar to the entered abstract.

Jane offers to limit a search to language, publication types and simple open access options. The information about accessibility is retrieved from the directory of open access journals (DOAJ) and from the list of indexed journals in PubMed Central.

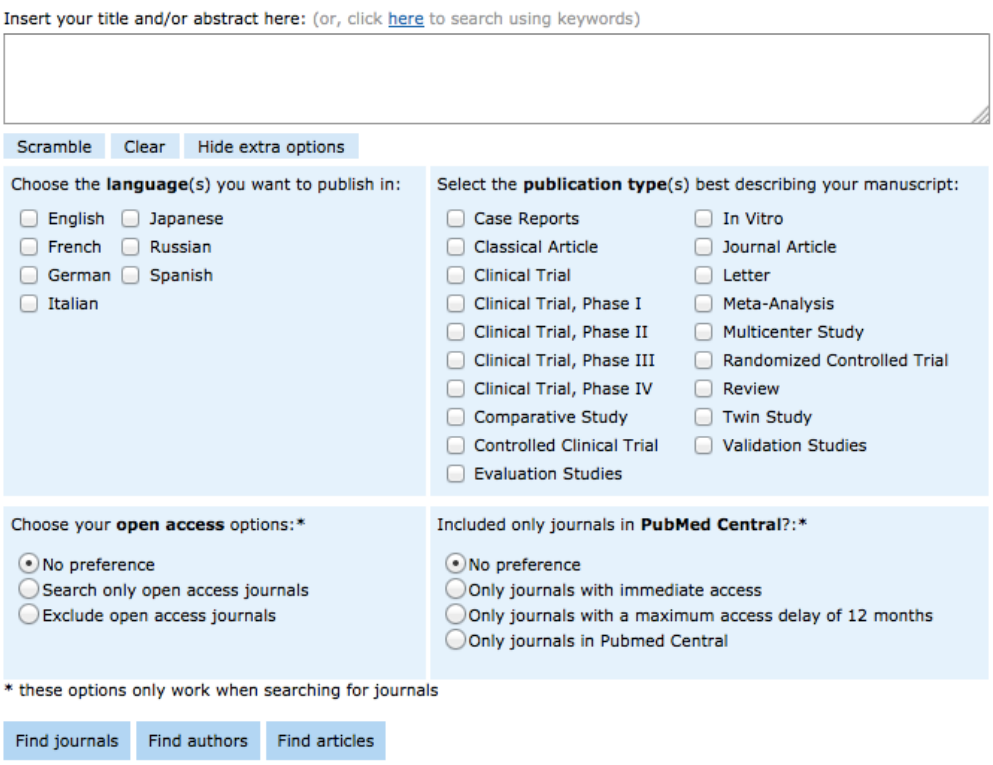

Figure 3: Screenshot of Jane (Accessed July 2013)

2.1.4 Edanz Journal Selector

The Edanz Journal Selector (http://whichjournal.com, see Figure 4) is a free to use web-based application, which according to the website "uses advanced matching algorithms and natural language processing to identify the 'fingerprint' of a scientific text and match it to the fingerprint of a journal's content."

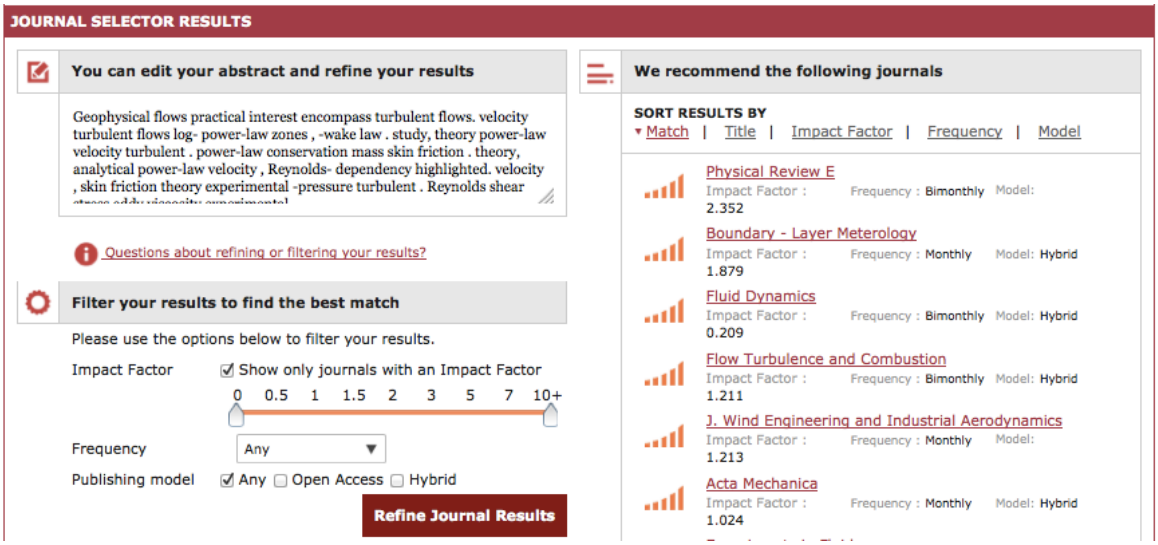

Figure 4: Screenshot of Edanz Journal Selector (Accessed July 2013)

How the Journal Selector works in detail is not very well described. According to its website "publicly available data from publisher websites, feeds, promotional materials and publications, along with data provided directly by our publisher partners" were gathered to create the Journal Selector.

According to the developer (Shen, 2013a, 2013b) data from Pubmed, Springer and the journal tables of contents (JournalTocs project) were used.

> "First, we collected as many articles/abstracts as possible from multi sources and then grouped them by journals, so we have the publication history for each journal (of course depending on the openness of the journals). Each time the user input the abstract, the relevancy between it and the historical data of each journal (we also normalized the data to make it as fair as possible for journals) will be calculated. The result is a list of journals ordered by ranks rather than articles with publishers' information."

The Edanz Journal selector offers also a filter by Impact Factor and by publishing model. The Publishing model is expressed by the values full open access, hybrid and non-open access.

2.1.5 Sherpa Romeo FACT: Funders' & Authors' Compliance Tool

Sherpa Romeo FACT is a tool (http://www.sherpa.ac.uk/fact, see Figure 4), which enables authors to check as to whether a journal or publisher offers publication or archiving rights compliant with their funders' policy. The tool was developed as a direct response to the new OA policies of the Research Councils UK (RCUK), which came into effect at the beginning of April 2013. It combines information from Sherpa Romeo, a database containing information about the rights an author has, when he/she publishes with a publisher with the requirement of funders (currently only UK funders). The tool allows the author to select one journal and one or several funders. As result he/she will get information about what action is (or is not) needed to comply with the funders policy.

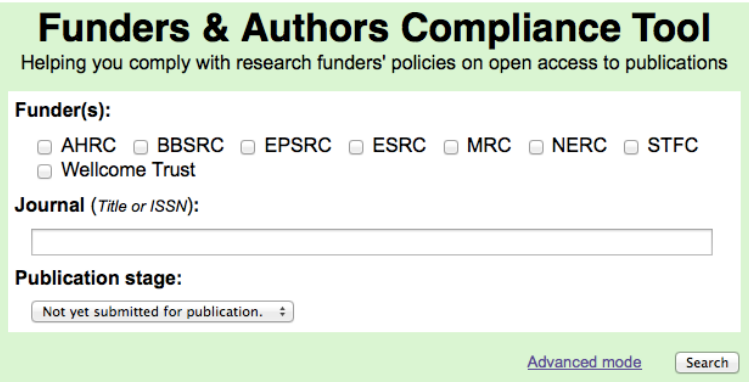

Figure 5: Screenshot of Sherpa Romeo FACT (Accessed July 2013)

2.2 Literature about the selection of journals

A comprehensive model about factors of the submission decision is provided by Björk & Öörni (2009). The model (see Figure 6) includes several indirect and direct factors, which have been grouped to the four categories: infrastructure, readership, prestige and performance.

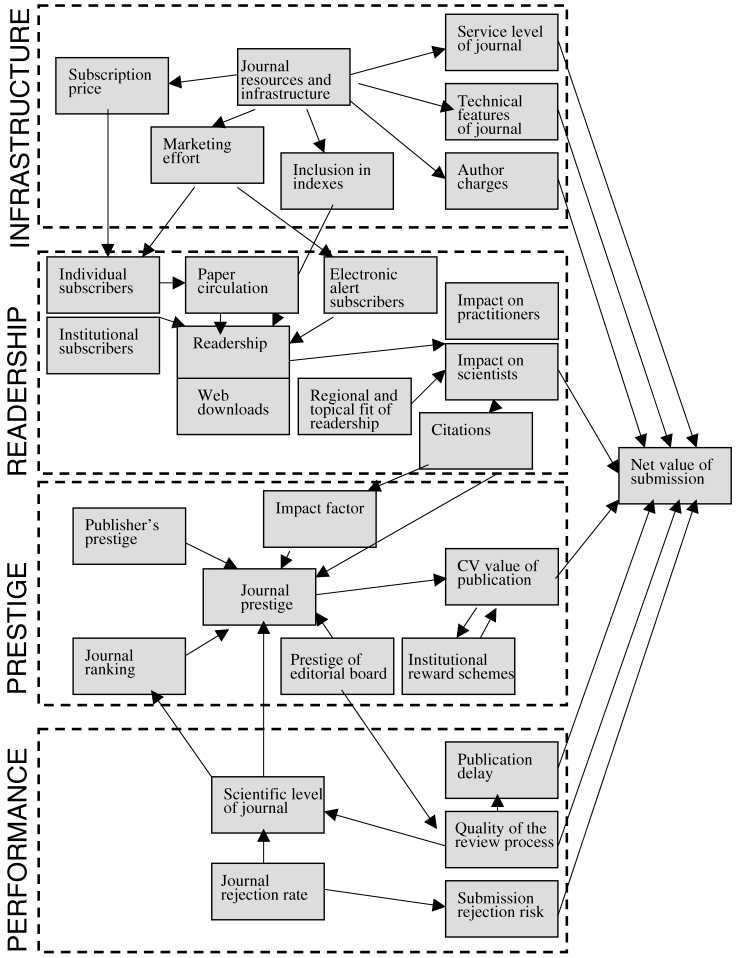

Figure 6: Net value of submission (Source: Björk & Öörni, 2009)

This categorization will also be used in the following section to present these factors and relate it to findings from the literature.

2.2.1 Infrastructure

The journal infrastructure consists of several technical and non-technical services a journal provides to its authors and readers.

Technical services include the electronic submission and review tracking system, features of the journal platform like the handling of supplementary data, the layout and linking features, the offering of download statistics or the inclusion in relevant indexes and databases. In opposite to the just enumerated services, the

existence of rather new technical features like the integration of Web 2.0 tools, reader comments/ratings or the availability of the prepublication history to were stated by authors be of less importance (Nariani & Fernandez, 2012).

Non-technical services consist of the marketing effort by the journal or publisher and the whole price setting. In scientific publishing there exist various business models. Among the most used ones is the subscription-based model where individuals and institutions (via libraries) subscribe to a single journal or to a package of journals. Although the prices of each journal are well defined by an official price list, the eventual price an institution has to pay usually depends on various factors like number of employees, previous transactions, bundling with other products, length of contract or even negotiation strategy.

On the other hand there are Gold open access journals. Journals that provide immediate open access to all of its articles on the publisher website. Many OA journals operate on a business model to charge the author or his/her institution for each published paper. These fees are often also called article processing charges (APCs). A study (Solomon & Björk, 2012a) has analyzed 1370 journals charging APCs and found an average APC of $906 USD and a price range between $8 and $3,900 USD. It can be assumed that the price is not strictly bound to the real production costs, which often are unclear and publishers (even OA publishers) are not transparent about their internal costs (Van Noorden, 2013a). But with this price range, the APC is indeed a very important factor to select a journal.

2.2.2 Readership

When authors choose a journal one of their top considerations is to reach a suitable audience (Cheung, 2008; Doty, 2013; Garvey, Lin, & Nelson, 1970). They might consider the regional and topical fit of the readership as well as the expected impact on practitioners or scientists.

With the traditional print and subscription models the readership could be determined by the individual and institutional subscribers or by the paper circulation. With the shift to electronic information the readership can be measured by web downloads on article level.

2.2.3 Prestige

With upcoming of bibliometrics, it was assumed that the numerous approaches to measure the impact of publications would influence the choice of scientists. In particular the start of the Impact Factor (IF) in 1975, which created a discipline specific ranking of journals, led to the assumption that authors would seek to publish only in the best-ranked journal to get recognition.

Interestingly this assumption couldn't be clearly confirmed in early studies (Gordon, 1984; Luukkonen, 1992), where criteria such as to reach a suitable audience or local journal were still more important than the impact factor and ranking of a journal.

This balance obviously has changed in the following 10 years. In particular in the life sciences, the significance of the impact factor has reached a level, which in the eyes of many scientists itself was not positive. In a much cited commentary in *Nature* (Lawrence, 2003) discomfort was expressed:

> "Scientists are increasingly desperate to publish in a few top journals and are wasting time and energy manipulating their manuscripts and courting editors. As a result, the objective presentation of work, the accessibility of articles and the quality of research itself are being compromised. [...]
>
> Evaluations of scientists depend on numbers of papers, positions in lists of authors, and journals' impact factors."

This initial criticism to (mis)use the impact factor for the purpose of research assessment has been repeated by vast number of authors in the last decade (Brembs, Button, & Munafò, 2013; Simons, 2008; Virchow, 2009). Nevertheless the journal ranking as measured by the impact factor has influenced the thinking and publishing behavior of scientists and is likely to stay. A questionnaire among 54 Danish medical researchers (Sønderstrup-Andersen & Sønderstrup-Andersen, 2008) showed that app. 80% of the researchers share the opinion that the impact factor does indeed have an influence on which journals they would prefer for publishing. The questionnaire also showed a statistically significant correlation between how the researchers personally rank journals and the journal ranking by the impact factor. However there was no significant correlation between journals where the researchers actually have published papers and journals in which they would prefer to publish in the future measured by impact factor.

The significance of journal rankings can also be recognized when checking blogs of scientists who give advise about the selection of a journal (Carr, 2011; Golash-Boza, 2011; Smith, 2012). To consider the impact factor and the position of the journal in the ranking is always part of the advice.

Studies from the fields of construction management and education (Bröchner & Björk, 2008; Cheung, 2008) indicate that the journal ranking is not in all scientific disciplines such influential. This might be the case, because in these field the research is rather addressed to practitioners.

2.2.4 Performance

One aspect of the performance of a journal is the speed of publication. Garvey et al. (1970) reported that it took around 6 months in physical sciences or a year in social sciences from manuscript submission to the final journal publication and therefore the speed of publication was found to be a top criteria. In the meanwhile, the publishing process has become generally faster. For example 90 days are reported by the publisher Frontiers (2013). Yet the speed of publication remains to be a top criteria to choose a journal (Solomon & Björk, 2012b; Warlick & Vaughan, 2007).

Related to the speed up publication is the chance of rejection. Since it's against good practice and rules to submit a paper to several journals at the same time, a rejection causes a delay in the communication of research results. Therefore the knowledge about the rejection rate but also about the topical focus of a journal helps author in their decision process. The better the topical fit and the lower the general rejection rate, the higher the probability the paper is accepted in a journal.

Another part of the performance of a journal is the quality of the review process. Despite the controversial debate about peer review (Akst, 2010; McCook, 2006; Science and Technology Committee, 2011) and new (proposed) forms (Pattinson, 2012; Wicherts, Kievit, Bakker, & Borsboom, 2012) it's still the predominant way to ensure the quality of a paper. Authors are interested in a smooth and fair review process and hope for helpful comments from the reviewers. Depending on the general editorial policy but also on the actual editors, the perceived quality of the review process differs from journal to journal.

2.3 Journal selection & open access

A study among US life scientists (Warlick & Vaughan, 2007) report about the attitude of authors towards OA when choosing a journal to submit a paper. Again it was found that the publication quality is of utmost importance, and that free public availability and increased exposure may not be strong enough incentives for authors to choose open access over more traditional and respected subscription based publications. It was partially found that many authors believe that OA journals are of less quality.

The reasons for this perception are quite obvious. Because publishers are reluctant to convert traditional and respected journals into a pure open access business model, many of the 10000 OA journals are newly founded and therefore often lack the traditional quality signs of established journals. It usually takes years to get a name and an impact factor. In particular since the quality of a journal is mostly

defined by the quality of the content, but good content is only submitted to journal with a high perception of quality beforehand which presents a vicious circle. Björk & Solomon (2012) concluded after a comparison of the scientific impact of subscription based and OA journals that "there is no reason for authors not to choose to publish in OA journals just because of the 'OA' label, as long as they carefully check the quality standards of the journal they consider."

Additionally so-called predatory publishers are currently confusing the authors. They try to profit from prepaid article processing charges, but without providing real scientific publishing (Butler, 2013a, 2013b). This kind of sham abuses the concept of OA and doesn't help to create an image of quality for someone who is not so acquainted with the matter of OA publishing.

A recent initiative from the Netherlands called "Quality Open Access Market"[2] tries to address this issue by assessing factors like editorial information, peer review, governance, process and valuation from academic OA journals by librarians.

2.4 What is missing?

As shown in Chapter 2.1 existing systems suggest a journal based on the similarity between the entered abstract and previous historical abstracts or even fulltexts of a journal. They also let the user filter and sort by impact factor or open access.

There exist no research about the perception and use by researchers of such recommendation systems. What is the researcher's perception of these tools? Can such recommendation systems really guide researchers to publish in a certain journal? To answer these questions more investigation is needed.

Currently there is no approach or tool that supports researcher to select a journal for publishing, which not only checks how the text fits into the journal based on the content, but also includes rather sophisticated factors like openness, self-archiving right, prices (subscriptions or article processing charges).

These factors are supposed to be more important to other stakeholders like funders, universities and their attached libraries. Which factors in specific and to what weight is also unclear. But it's quite sure that excluding these factors from the recommendation system at all will lead to an unbalanced ranking.

[2] https://www.qoam.eu/about

3 Research Description

3.1 Thesis statement

To fill the previous mentioned gap, the thesis statement is formulated as following:

> It is possible to design a system that helps researchers to choose a journal that improves the balance of their personal interests as well as institutional, funder or library requirements over choosing a journal with an existing system.

3.2 Research Questions

In particular the following research questions will be addressed:

- *What are the stakeholder's interests in the journal selection process?*
  - *What are the interests of the authors?*
  - *What are the interests of the institution?*
  - *What are the interests of the funder?*
  - *What are the interests of the library?*
- *How can a better balance of different stakeholder's interests be achieved?*
- *What are the journal characteristics that are relevant for the balance?*
- *What kind of functionalities like filters or self defined input fields should the journal recommendation systems have?*
- *What's the ranking-algorithm for a well-balanced recommendation?*
- *How can the quality of the balance be measured?*

3.3 Research Methodology

IT research deals with artificial phenomena. Such artificial phenomena can be both created and studied. So according to March & Smith (1995) there are two kinds of scientific interest in IT:

- *Descriptive research: aims at understanding the IT as knowledge-producing activity corresponding to natural science*
- *Prescriptive research: aims at improving IT performance as knowledge-using activity corresponding to design science*

For this thesis an artifact (recommender system, algorithm) will be generated and evaluated. Therefore *Prescriptive research* or Design Science Research (also called Design Research) is an appropriate research methodology for this thesis.

Design research consists of five phases (Takeda, Veerkamp, & Yoshikawa, 1990):

1. *Awareness of the problem: to pick up a problem by comparing the object under consideration with the specifications*
2. *Suggestion: to suggest key concepts needed to solve the problem*
3. *Development: to construct candidates for the problem from the key concepts using various types of design knowledge*
4. *Evaluation: to evaluate candidates in various ways, such as structural computation, simulation of behavior, and cost evaluation*
5. *Conclusion: to decide which candidate to adopt, modifying the descriptions of the object.*

In the following section each phase is shortly described with the specific approach for this thesis.

3.3.1 Awareness of the problem

The general background and motivation to design a recommendation system for the journal selection has already been outlined in chapter 1 (background & motivation). As the short literature review (see chapter 2) has shown, the stakeholder's interests in the journal selection process can partly deducted from the literature. Further interviews with at least two researchers, librarians and representatives of funders and universities were conducted to complete the statements found in the literature.

3.3.2 Suggestion

In this phase the "ingredients" of the recommendation system were selected and mixed together. The interviews with the different stakeholder helped in most cases to determine what factors (data) were needed to create a recommendation. A further questionnaire and revealed what factor really mattered and how these factors have to be expressed and weighted in a ranking-algorithm, which balances the stakeholder requirements.

3.3.3 Development

The four interviewed researchers were also asked to provide abstracts as test cases. These abstracts then were entered into the recommendation system of whichjournal.com and JANE. So for each abstract the recommendations in form of ordered journal lists were derived. These journal list were joint together resulting in four sets with journals

- *Dentistry (30 journals)*

- *Psychology (31 journals)*
- *Aerosol Chemistry 1 (22 journals)*
- *Aerosol Chemistry 2 (28 journals)*

This journal list was then expanded with attributes (factors) needed for the new algorithm. With all the information gathered a new ranking for all sets was computed.

3.3.4 Evaluation

The stakeholder groups (librarians and researchers) were asked to select the best five journals from the sets, while for the funder perspective the five best journals were computed by the previously reported priorities.

Eventually the new generated ranking was compared against the ranking of existing systems (Whichjournal and JANE), by measuring the average precision.

3.3.5 Conclusion

In this last part the results were discussed.

4 Data Collection

4.1 Stakeholder's interests

In order to determine the stakeholder's interests, representatives of all groups (author, institution, funder and library) were approached to conduct interviews. The following sections summarize the received e-mail and interview responses.

4.1.1 Researcher

Four experienced researchers from different Swiss research institutions in the disciplines of dentistry, psychology, environmental toxicology and aerosol chemistry were approached to learn more about how they select journals to publish. For the interview a semi structured survey (see Appendix A1: Interview Questions Researcher) was used as guideline. The given answers about the importance of several predefined factors were classified from "little" (1) to "much" (5) and can be found in Table 1.

	Peer Review	Editorial Board	Speed of publication	Rejection rate	IF	Topical Match	Number of readers	Technical Features	Indexed	Price	OA
Researcher 1 - Aerosol Chemistry	5	5	3	1	5	5	1	1	5	1	4
Researcher 2 - Psychology	1	1	1	1	5	5	1	1	1	1	1
Researcher 3 – Envir. Toxicology	5	3	5	1	5	5	2	1	1	1	5
Researcher 4 - Dentistry	3	2	5	1	4	5	1	3	5	1	2

Table 1 Influence factors for the choice of the journals (1 = little, 5 = much)

Topical Fit

For all researchers the topical fit is the most important criterion. The aims and scope of the journal should match the own work in order to find the relevant readership. Relevant not necessarily implies many, as all researcher are rather indifferent regarding the reported amount of readers/subscriptions of a journal. It was also mentioned by one researcher, that the group usually has already a target journal in mind when the start the research. Another researcher mentioned that she tries to publish in rather general than specific journals, in order to reach colleagues from other disciplines, as her research can contribute to their fields as well.

Impact Factor / Reputation

All researchers do care about the reputation of journal as expressed by the Impact Factor. For the postdoctoral researcher who strives for habilitation, publishing in journals, which are classified in the upper third of the Journal Citation Report (JCR) for his discipline are required by the regulations. However it's also known that this part of the regulations is sometimes not strictly applicable, in particular where the JCR category is very broad, but the research field is very specific and there are only a few suitable journals in the upper third ranking of the whole discipline.

Besides achieving individual career goals, publishing in journals with a high impact factor is in generally important for the assessment and financial benefits of a whole group or institute. One researcher also mentioned that the outlook to generate a publication in a high impact journal even is considered when he requests time to use a unique facility/instrument.

Review

Also quite important is the peer review quality. Authors like to get fair and beneficial feedback and often do know journals from previous publications where they get at least one good review. The specific type (single or double blind, open or just technical soundness) seems to be a subjective matter of preference and experience. Interestingly one researcher, who recently published in PLOS One was unsatisfied with the peer review quality. The review process in PLOS One is only formal and does not cover the content itself or the relevance. In the view of the interviewed researcher to get so less feedback was disappointing and therefore she won't publish in this journal again.

Editorial Board

An important but not an exclusion criterion is the composition of the editorial board, which also represents the reputation of the journal. Some researchers occasionally check the names on the editorial board. It was also mentioned that as rather young scientist it's hard to evaluate and also in the case of general journal most of the names are unknown. Besides the composition of the editorial board the society behind a journal can also influence the choice of publication.

Speed of publication

Almost all researchers prefer a short publication time. Especially the time until the first decision should be very short, so not much time is lost if the manuscript will be rejected. This first decision from the editor to pass the article further for reviewing is usually expected within 1-2 weeks. According to the environmental

scientist the review (until final acceptance) should be within 90 days. Once the paper is accepted the time until final publication is not so essential, as many journals will publish an provisional version on their website quite soon after acceptance. Any unexplained delays by the publisher are annoying and can lead to exclusion of the journal for further submitting. Especially when the author is active as reviewer for the same journal and is pushed by the publisher/editors to review quickly, there's no acceptance for long delays of the own paper. A professional handling of the publication process is expected, especially when the journal charges a fee. The importance of a fast publication process increases if the paper contains research results of high novelty.

Acceptance Rate

All interviewed researcher don't explicitly care about the acceptance/rejection rate. One researcher responded, that a high rejection rate could also mean that a lot of "crap" is submitted. It rather seems that researchers automatically expect a higher rejection rate with higher ranked journal and therefore are trying to match the strength of their papers with the ranking of the journal to avoid any unnecessary rejection. According to one researcher it's more satisfying to get accepted in the first journal, than risking to get rejected by submitting to high ranked journals first. In his group there is also common knowledge that it's pointless to submit a paper to a certain journal.

Indexing in abstract databases

The visibility of the own work is important to most researchers. However as all interviewed researchers are from disciplines, where electronic publishing is standard, it's simply expected that a journal is indexed in the discipline-specific databases (like Pubmed, PsychInfo or Web of Science) and there is not much difference between the journals. It was mentioned from the researcher in the field of dentistry that he would only consider an open access journal if it is indexed in PubMed.

Open access

All researchers generally have a positive attitude towards open Access and expressed their interest, although it's not a top priority when choosing a journal. One researcher reported that the top journal in his field is an OA Journal (Atmospheric Chemistry and Physics), while two others complained not to have any "good" OA journals in their fields. When asked about the disincentives of OA publishing the missing of established OA journals were mentioned several times. One researcher clearly expressed that sending a "good" paper in a "bad" OA-journal is not an option, because he doesn't like risk a good assessment at the end of the

year. Further it was added that open access is not always well known among peers and some (falsely) assume that with open access they would also have to make their research data public. Also funding of open access charges (APC) could be a problem for some.

All research institutions of the interviewed researchers are signatories of the *Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities*. One institution supports the funding of APCs without price cap, provided the journal is pure OA, in the *Science Citation Index Expanded* and the first author is an employee of the institution. The researcher already had used this option. She also bought hybrid open access from project money, yet she's aware that this is not sustainable. For another researcher the funding is neither a problem as there is the possibility to get the reimbursement of the publication charge (even for Hybrid OA publishing). However this option is dependent on the goodwill of the institute director and only considered for "good" papers, which make the investment worthwhile. But because there are no good OA-Journals that would charge an OA fee in his field this option hasn't been used yet. Also the expected additional administrative effort (talk with the institute director about the importance of the paper, paying privately and then requesting the reimbursement) is rather deterring than status quo.

It was also mentioned by another researcher that if a journal has a high Impact Factor and requires a larger APC this would not be a problem.

All researchers were indifferent about the self-archiving-rights.

Price

The subscription price of a journal has no influence at all on the choice of the journal.

Technical features

Also rather insignificant are the technical features of a journal or its platform. A clean HTML and PDF with a decent quality are sufficient. Usually all journals can offer that and additional features are nice to have.

4.1.2 Funder

The Swiss National Science Foundation (SNSF) is the largest science funder in Switzerland. In an E-Mail response (Jecker, 2013) the following principles were highlighted to be important:

- *Freedom of choice with regard to the place of publication and OA road*

- *Quality assurance (journal should have a mechanism to ensure scientific quality.*
- *Public accessibility of research results as far as possible (ideally short embargo periods).*
- *Cost saving publication models (which provides a transparency about costs).*

These principles are also included in the guidelines about open access (SNSF, 2013) where green open access is required, with the exception in the case of insurmountable legal and/or technical obstacles. The SNSF encourages researchers to opt for the Gold Road where possible, but rejects hybrid models.

Quite similar interests were expressed in a position statement from Science Europe (2013). Science Europe promotes the collective interests of the Research Funding and Research Performing Organizations of Europe, including the SNSF. For Science Europe both routes (green and gold) are acceptable. Publications should be made available in open access in all cases no later than six months following first publication. In Arts, Humanities and Social Sciences, the delay may need to be longer than six months but must be no more than 12 months.

Science Europe Member Organizations also "require that funding of open access publication fees is part of a transparent cost structure, incorporating a clear picture of publishers' service costs" and that there are effective mechanisms „in place to ensure that the publication of research outputs is subject to rigorous quality assurance".

Further they „expect publishers to apply institutional-, regional-, or country-based reductions in journal subscriptions, in line with increases in author- or institution-pays contributions" and „stress that the hybrid model, as currently defined and implemented by publishers, is not a working and viable pathway to open access."

4.1.3 Library

In addition to the researcher, the librarians from the same institution were interviewed. Again a semi-structured survey was used as guideline (Appendix A2: Interview Questions Library). It's noteworthy to mention that various types of librarians (subject librarian, open access coordinator, library director, open access librarian) were represented and each with a different perspective on open access or the scientific publishing industry.

Open Access policy – encouragement and requirement

All librarians confirmed that their institutions have an open access policy. In three cases the libraries are in charge of the implementation. Therefore all librarians agreed that open access should be an important part when researchers publish.

According the open access coordinator authors should publish in journals with an open license like CC-BY and they also should choose a journal with prestige: If publishing in an open access journal means to risk a career (young researcher), then it should be avoided. It was added by another librarian, that it's recommended to publish in journals from small societies, as these journals tend to cost less.

Impact Factor

All librarians were appreciative of the need from researchers to publish in journals with a high Impact Factor, even though they know that often these journals are not open. While one librarian argued that the IF is a good measure to rate journals, the other three librarians were rather skeptical and stressed the fact that authors should more care about the quality of the paper instead of the journal. Also there are many disciplines in humanities, where the IF is irrelevant.

Self-Archiving

There was no doubt that authors should also make sure that they have the right to make the article accessible on the repository or somewhere else. It will increase the visibility and it's regarded as responsibility towards the funder.

Price

All librarians stated that researcher should not have to care about the subscription price, except for very expensive journals. However it is seen as responsibility of the library to have a look at that. One librarian, who is also strongly involved with the acquisition of journals, argued that publishers, which have a yearly price increase of 10% should be avoided. Also there are new journals from big publishers, which start already with a (too) high price. Those publishers don't price the effective costs with a small margin, but take whatever they can get.

He also reported that there's no fixed number or range within a subscription price is regarded as fair or as too high. It depends on the usage within the institution. Price/download or price/page could be indicators. The usage and the judgment about whether a journal is too high are also connected to the research area of the institute. In case of very specialized journals, which fit exactly to the research area of a research group, a small usage (20 downloaded papers/year) and therefore high cost per usage might be justified.

The subject librarian, who's responsible for the journal holdings in his subject, responded that any journal that is requested by a researcher and where the price is below $1000 is usually bought directly without any discussion.

Only one library has publication funds, where authors can get reimbursement, when they have been publishing in an open access journal that required a fee. To

be eligible the paper should be submitted to a journal that is indexed in the Journal Citation Reports Expanded. As of to today there's no price cap.

All other libraries "only" have memberships (like for BiomedCentral or PLOS), where the author automatically gets some discount on the article processing charge (APC). The hypothetical question, if there is any requirement regarding the price was answered differently. One librarian was clear in favor of a price cap, while another stated that there should be no fixed price cap, but in in order to increase the awareness of the price, the library should only pay the half of an APC.

Journal selection process

Librarians do not publish in journals, but they often select and buy journals or if they work in the Open Access field have to recommend journals. Therefore they also have a certain conception of a "good" journal. In the last question of the interview the librarians were asked to describe what they regard as a good journal. The following list tries to summarize up the answers (starting with the most often mentioned response at the top):

- *Relevance for the community. Journal reaches the appropriate community where discourse is possible.*
- *Editorial board with "important" community members.*
- *Transparency (information regarding editorial board, peer review, self-archiving or pricing)*
- *Openness*
- *Explicitly NOT the rejection rate. Journals should be more open.*
- *Impact factor (compared to the field)*
- *Indexing in databases*
- *Publishing activities of the own institution (if the "own" researchers publish often in a journal, it's obviously a good journal)*
- *Should assign digital object identifiers (DOI)*
- *Nice layout*
- *Decent profit margin of the publisher*

4.1.4 Institution

In order to capture the different stakeholder interests, also representatives of the institution were approached for interviews. Actually this turned out to be more difficult than expected.

A first request for an interview with a director of a research institution was rejected, because the director felt that there is no substitute for looking closely at the

journals. And a system that would recommend a single journal would give author the impression that they do not need to think for themselves.

For a second institution two interviews were conducted:

The first interview was hold with two representatives who organize and perform the yearly research assessment for the medical faculty.

Each institute or clinic has to gather all publications in the categories:

- *Original work (in-house) – only peer-reviewed publications are considered*
- *Original work collaboration*
- *Further contribution*

For all publications the latest Impact Factor of the journal and the maximum ranking of the category of the journal in the Journal Citation Report is allocated.

For the assessment the total number of publication, the sum of the impact factor and the median of the maximum ranking will be calculated. Publications in journals without an impact factor won't be penalized, but won't be considered in counting the median.

Actually the assessment seeks to measure an objective state. Yet it's well known at the faculty that the existence of the assessment methods will automatically generate unwanted incentives for researchers. However this hardly can be avoided except one would not perform an evaluation at all.

This interview was very beneficial to understand how the evaluation of the faculty works today, but the interview partner weren't able to answer the question how for example the open access policy of the same institution fits into that system.

Therefore a second interview was conducted with the vice dean for research of the medical faculty. He is also institute director and editor of a high ranked medical journal published by Wiley. During the interview it soon had become clear that expecting revealing answers from someone who is in all these three roles and being author at the same time is difficult, because there are obviously contradictory interests. Pushing the compliance of the institutional open access policy, but remaining editor of a closed access journal (something that is probably important for the own career) is clearly contradictory.

Therefore the interview was very enlightening with regard to the slow uptake of open access, but not about what are the priorities of the faculty. Most universities in Switzerland have a self-organized structure and are governed by active researchers. The scientific community or the institution as a whole has expressed the interest on open access (having an institutional policy or having signed the Berlin declaration) and would clearly benefit from a change of the current system.

But as long as those who would be affected by this change can decide about whether this change should be enforced or not, hardly anything will happen. So the conclusion of this both interviews was that it's hard to find a single voice for institution.

A further interview was hold with somebody from the research assessment of a third research institution. There the publications are considered as an important part of the assessment as well. While the name or the IF of a journal remains important, the assessment also considers citation data of the individual works, whenever data is available from Scopus or Web of Science. This method is actually preferred as it is a more direct way to measure research quality, which is defined by the acceptance from and the significance to the community. Usually there is an expert group (Evaluation commission), which consists of other peers, who will assess the publication lists as part of the whole assessment at the institution. They may check the amount, the categories and types of publications. Yet there is not a static form with criteria upon the assessment is based. Only the faculty of medicine uses the Impact Factor as measurement.

High impact journals like Nature and Science will always be important and from the perspective of the university one would unnecessarily throw away a good chance for publicity, when choosing an OA journal instead. Yet OA should be considered for the middle field of the publications.

After three interviews the institutional perspective remains fuzzy. Actually it still not clear who represents and speaks for the institution. It rather seems that the institution also consists of particular interests not always in coherence with each other. Therefore the institutional perspective will not be included in the ranking. The perspective may is already included with the researcher and library perspective. Also not all of the interviewed persons were willing to participate in a further questionnaire and therefore it would have become difficult to evaluate the ranking of the institutional perspective.

4.2 Building the samples

In the next step all researchers were asked to provide an example abstract. These abstracts were entered in JANE and the Edanz Journal selector to retrieve journal recommendations, similar to the abstracts.

So for a given abstract 13 journals were retrieved from whichjournal.com (Table 2) and 26 journals from JANE (Table 3). Finally both list were merged together and formed the basic journal list for the abstract.

Ranking	ISSN-L	Title
1	0894-8275	American Journal of Dentistry
2	0287-4547	Dental Materials Journal
3	1496-4155	Journal of Esthetic and Restorative Dentistry
4	1678-7757	Journal of Applied Oral Science
5	0300-5712	Journal of Dentistry
6	1432-6981	Clinical Oral Investigations
7	1552-4973	Journal of Biomedical Materials Research Part B Applied Biomaterials
8	0022-3913	Journal of Prosthetic Dentistry
9	0033-6572	Quintessence Int.: clinically relevant, scientifically based
10	0957-4530	Journal of Materials Science: Materials in Medicine
11	0268-8921	Lasers in Medical Science
12	0305-182X	Journal of Oral Rehabilitation
13	1878-0180	Journal of the Mechanical Behavior of Biomedical Materials

Table 2: Journal Recommendations from Whichjournal.com (http://doi.org/q7h)

Ranking	ISSN-L	Title
1	0109-5641	Dental materials
2	0361-7734	Operative dentistry
3	1678-7757	Journal of applied oral science : revista FOB
4	0972-0707	Journal of conservative dentistry : JCD
5	0300-5712	Journal of dentistry
6	1735-2150	Journal of dentistry (Tehran, Iran)
7	1305-7464	European journal of dentistry
8	1432-6981	Clinical oral investigations
9	1698-4447	Medicina oral, patología oral y cirugía bucal
10	0287-4547	Dental materials journal
11	1461-5185	The journal of adhesive dentistry
12	1735-3327	Dental research journal
13	2008-210X	Journal of dental research, dental clinics, dental prospects
14	1343-4934	Journal of oral science
15	2005-7806	The journal of advanced prosthodontics
16	1496-4155	Journal of esthetic and restorative dentistry
17	0033-6572	Quintessence international (Berlin, Germany : 1985)
18	0002-8177	Journal of the American Dental Association (1939)
19	0268-8921	Lasers in medical science
20	1059-941X	Journal of prosthodontics
21	1526-3711	The journal of contemporary dental practice
22	1059-910X	Microscopy research and technique
23	0305-182X	Journal of oral rehabilitation
24	1117-1936	The Nigerian postgraduate medical journal
25	0970-9290	Indian journal of dental research
26	0894-8275	American journal of dentistry

Table 3: Journal Recommendations from JANE (http://doi.org/q7g)

All journals included in JANE or Whichjournal.com came a long with an International Standard Serial Number (ISSN). Usually a journal can have different ISSNs depending on the format (electronic or print). In order to achieve an unambiguous identification of the journals, all ISSN's were subsequently converted into the Linking ISSN, using the official *ISSN to ISSN-L* mapping table of the ISSN registry and some additional corrections (Data: http://doi.org/q79).

4.3 Gathering the journal characteristics

Now for each journal several characteristics were gathered:

4.3.1 Journal Citation Report

The Journal Citation Report is published annually by Thomson Reuters and is based on data from the Science Citation Index. The 2012 Edition includes around 10850 journals. The following attributes were retrieved, where available.

Impact Factor (IF)

In a given year, the impact factor of a journal is the average number of citations received per paper published in that journal during the two preceding years. For example, if a journal has an impact factor of 3 in 2012, then its papers published in 2010 and 2011 received 3 citations each on average in 2012.

5-Year Impact Factor (IF)

The 5-year journal Impact Factor is the average number of times articles from the journal published in the past five years have been cited in the JCR year.

Immediacy index

The immediacy index is the average number of times an article is cited in the year it is published. It shows how fast articles are cited following their publication.

Total Cites

The total number of citations to the journal in the JCR year.

Articles

The total number of articles in the journal published in the JCR year.

4.3.2 SCIMago Journal Rank

SCIMago, a research group from Spain, provides an alternative measurement of the scientific influence of journals. The SCImago Journal Rank is based on data from the bibliographic database Scopus and is also promoted as (free) alternative to the impact Factor. The 2012 edition includes around 20500 journals. The following attributes were collected were available.

SCImago Journal Rank (SJR)

SCImago Journal Rank indicator. It is a measure of journal's impact, influence or prestige. It expresses the average number of weighted citations received in the selected year by the documents published in the journal in the three previous years.

Hirsch index (H index)

Journal's number of articles (h) that have received at least h citations over the whole period.

Total Docs. (2012)

Journal's published articles in 2012. All type of documents are considered.

Total Docs. (3 years)

Journal's published articles in 2011, 2010 and 2009. All type of documents are considered.

Total Cites (3 years)

Number of references included in the journal's published articles in 2012.

Citable Docs. (3 years)

Journal's citable documents in 2011, 2010 and 2009. Citable documents include: articles, reviews and conference papers.

Cites / Doc. (2 years)

Average citation per document in a 2 year period. This metric is widely used as impact index.

Ref. / Doc.

Average amount of references per document in 2012.

4.3.3 Journal Prices

The journal pricing related indicators were obtained from website journalprices.com created by the economists Bergstrom and McAffee. The sixth edition released in 2013 contains data from 10100 journals. The authors stress that their collected data is a best effort approach. Prices are not always transparent and directly comparable without making some conversion and assumptions. According to the detailed explanation (Bergstrom & McAffee, 2013), the subscription prices were retrieved from publisher's price lists, journal web sites and direct correspondence with journal editors and publishers. Where the 2013 price couldn't be found, but the 2012 or 2014 price was available, that price was used. Usually the price of an institutional "online only" subscription was considered, otherwise either the print edition or the "print-plus-online" edition were used. In case of journals with tiered price structure, the price for a single-campus with enrollment of 25000 or larger was applied.

From this data the following attributes were looked up:

Price per Article

The total number of articles published by each journal in the five years 2007-2011 according to JCR. The price per article is simply the price of this journal for a year's subscription to an academic library divided by the average number of articles published per year.

Price per Citation

The price per citation is the price of this journal for a year's subscription to an academic library divided by the recent citation rate. The "recent citiation rate" is the number of times that volumes of a journal published in the years 2004-2009 were cited in 2009 by ISI-listed journals, divided by 5.

Composite Price Index

The Composite Price Index (CPI) is the geometric mean of the Price Per Article and the Price per Citation.

Profit Status

The profit status of the owner of a journal.

Relative Price Index

The relative price index (RPI) for a journal is calculated by dividing its CPI by the median CPI of those non-profit journals in its subject category that have positive subscription prices. Journals that have multiple subject listings are factored into the average CPI for each field that they belong to.

4.3.4 Open access

There are various levels of openness as described by (SPARC, PLOS, & OASPA, 2013). A gold OA journal that provide immediate open access to all of its articles on the publisher website is indeed more open than a traditional subscription based journal. But within gold OA and subscription bases journals there are even more differences. A gold OA journal might allow free access to readers, but doesn't allow further distribution or commercial use. Many OA journals now use the most liberal Creative Commons license CC-BY, however still some publisher and researcher don't feel totally comfortable with this kind of openness, which allows anyone to do anything, as long credit is given to the authors (Priem, 2013; Van Noorden, 2013b).

Even within traditional journals there are differences. Some journals will grant public access after a certain period of time, while others remain closed forever. Some journals allow researchers to make a copy of their papers freely available on their websites or in a repository. Again there are differences between publishers what version can be used for that. Some publishers only allow the preprint (version before peer-review), some allow the use of the postprint (version after peer review) and some even allow the use of the publisher's version (including the layout of the author). Some publishers stipulate an embargo (usually between 6 and 36 months) before the author can make a copy freely accessible.

The following categorization is based on "How Open is it?" (SPARC et al., 2013), but was extended at some points (like author rights).

Open access status

Journals were categorized according these three types:

1. *Open access*: Content of the journal is immediately free available at the journals website.
2. *Hybrid*: Content of the journal is not freely available on the journal website. But authors can pay a fee to make individual articles accessible.
3. *Closed access*: Content of the journal is not freely available on the journal's website.

Accessibility

The following categories describe the accessibility of the journal:

- *Free readership rights to all articles immediately upon publication.*
- *Free readership rights to all articles after 6 months or less.*
- *Free readership rights to all articles after 6 months and more.*
- *Free and immediate readership right to some, but not all articles (including "hybrid").*
- *Subscription, membership, pay-per-view, or other fees required reading all articles.*

Reuse Right

What are readers allowed to do with the content? Following categories were formed:

- *CC-BY*
- *CC-BY-NC or CC-BY-SA*
- *CC-BY-ND*
- *No reuse right beyond fair use*

Author's Rights

What are authors allowed to do with the content? Following categories were formed:

6.1 Author may post PUBLISHED VERSION to ANY repositories or websites immediately.

6.2 Author may post PUBLISHED VERSION to ANY repositories or websites with embargo of 6 months or less.

6.3 Author may post PUBLISHED VERSION to ANY repositories or websites with embargo more 6 months.

5.1 Author may post PUBLISHED VERSION to CERTAIN repositories or websites immediately.

5.2 Author may post PUBLI.SHED VERSION to CERTAIN repositories or websites with embargo of 6 months or less.

5.3 Author may post PUBLISHED VERSION to CERTIAN repositories or websites with embargo more 6 months.

4.1 Author may post POSTPRINT of the peer-reviewed manuscript to ANY repositories or websites immediately.

4.2 Author may post POSTPRINT of the peer-reviewed manuscript to ANY repositories or websites with embargo of 6 months or less.

4.3 Author may post POSTPRINT of the peer-reviewed manuscript to ANY repositories or websites with embargo more 6 months.

3.1 Author may post POSTPRINT of the peer-reviewed manuscript to CERTAIN repositories or websites immediately.

3.2 Author may post POSTPRINT of the peer-reviewed manuscript to CERTAIN repositories or websites with embargo of 6 months or less.

3.3 Author may post POSTPRINT of the peer-reviewed manuscript to CERTIAN repositories or websites with embargo more 6 months.

2. Author may post Preprint to certain repositories or websites.

1. Author may not deposit any version to repositories or websites.

Embargo Postprint / Published Version

Where embargoes are stipulated, the embargo period for the accepted author version (Postprint) and/or the published version was captured explicitly.

4.3.5 Charges

With Gold OA journal there occur huge differences between the APCs. Additionally it was recently shown by comparing APCs with impact that journals, which require higher APCs are not the most prestigious journal and vice versa (West, Bergstrom, & Bergstrom, 2013). A good system therefore should guide authors to journals with a higher impact, but the lowest publication charges as possible.

Open Access Processing Charge (APC)

A fee publisher request to make an article open access. Also includes Hybrid models. As some journals

Traditional Charges

Traditional charges like for color figures, pages charges or page excess charges. Could be incomplete as not always clearly stated on the journals website.

4.3.6 Speed of publication

The following three type of publication speed was caputured:

- *Average time from submission to first decision*
- *Average time from submission to final decision*
- *Average time from submission to final publication*

4.3.7 Review

It was attempted to collect data about the review process a journal use:

Review Type

Where it was possible the peer review process of a journal was categorized according to the following types:

- *Single Blind Review: The identity of the expert reviewer is unknown to the author.*
- *Double Blind Review: The identities of both the expert reviewer and the author are unknown to each other*
- *Open Review: The identities of both the expert reviewer and the author are mutually known, in an attempt to increase accountability.*
- *Technical Sound Peer Review: Only the Technical soundness of a paper is reviewed, not the relevance (like PLOS One).*
- *Single or Double Blind Review: Single or double blind depending upon the preference of the submitting author.*

Number of Reviewers

Additionally the number of external reviewers was collected as well.

4.3.8 Rejection / Acceptance Rate

Acceptance Rate

Although every journal has an acceptance rate, they are often not visible on the journal website. And there seems to be no complete directory with this data. At least for psychology some data could be obtained by Cabell's directory[3].

4.3.9 Abstract Indexing in Databases

Pubmed Indexed

PubMed is the most important database for biomedical literature. The US National Library of Medicine provides a yearly updated list with all historically and currently indexed journals[4] and several attributes. The status about the current inclusion was extracted.

PsycInfo Indexed

PsycINFO is an abstracting and indexing database devoted to peer-review literature in behavioral sciences and mental health. The Coverage List[5] was used to extract the Indexing status. As of August 2013 there were 2543 journals covered in PsycINFO.

4.4 Survey

The interviews conducted previously (section 4.1) were a first step to find about which indicators where generally important to the stakeholders. With an additional survey, it was aimed to get a more specific insight about what's relevant using the sample with the collected data (section 4.3).

4.4.1 Method

For the survey an online questionnaire was used (Appendix B: Online Questionnaire). The respondents (three researchers and four librarians) were asked to select the Top 5 journals according their view from the created list of journals from JANE and Whichjournal.com (described in section 4.2). Then for each choice, the respondents were asked to explain their ranking by mentioning the positive and negative aspects of the selected journals. The aspects could be chosen from a predefined list or could be expressed as free comment.

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[3] http://www.cabells.com

[4] ftp://ftp.nlm.nih.gov/online/journals/

[5] http://www.apa.org/pubs/databases/psycinfo/coverage.aspx

For all listed journals a factsheet with all the collected data for each journal was generated. The factsheets together with the raw data for own analysis (accessible at http://doi.org/rnx) were provided to the respondents to support their decision process.

4.4.2 Results

Researcher

All three researchers attached great importance to the topical match of the work with the aims and readership of the journal. For example in the present case of rather theoretical contribution journals with a more applied focus were not regarded as appropriate. Or the own contribution was regarded not as new or strong enough to be submitted to a certain journal. Besides the topical match, all researchers set also great value on the Impact Factor.

In addition to these two main factors the choice was influenced by various other factors (Figure 7). Not surprisingly there's also a discipline related importance. While for a dental researcher and indexing in PubMed is of strong relevance, it's hardly important for someone from psychology, where there exist with PsycINFO an own abstract database.

	Researcher 1 (Aerosol Chem.)	Researcher 2 (Psychology)	Researcher 3 (Dentistry)	Total	Mean
Topical Match	4	4	4	**12**	4.0
Impact Factor	3	4	4	**11**	3.7
Peer Review Type	3	2	3	**8**	2.7
Publisher	3	2	3	**8**	2.7
Editorial Board	2	3	3	**8**	2.7
Accessibility on Journal Website	4	1	2	**7**	2.3
Reuse rights	3	2	2	**7**	2.3
Indexed in PubMed	2	1	4	**7**	2.3
Journal assigns DOIs	4	1	1	**6**	2.0
APC	3	2	1	**6**	2.0
Author rights	2	2	2	**6**	2.0
Speed of Publication	2	1	3	**6**	2.0
Number of Reviewers	2	1	2	**5**	1.7
Traditional Charges	2	1	2	**5**	1.7
Acceptance Rate	1	2	2	**5**	1.7
Indexed in PsycINFO	1	3	1	**5**	1.7
Journal is owned by a society/institution	2	1	1	**4**	1.3
Price of Journal	2	1	1	**4**	1.3
Scimago Journal Rank	2	1	1	**4**	1.3

1 = not at all important, 2 = somewhat important, 3 = important, 4 = very important

Figure 7: Responses Researcher: What was the importance of attributes for your choice?

Librarians

The four librarians had no specific knowledge about the contribution (expect the abstract) and therefore could not evaluate the topical match. One librarian even refused to participate in the questionnaire, as he felt not being able to give a sound rating without knowing more about the specific contribution (like quality, intended readership). Luckily another librarian from the same library was able to step in.

For the discipline of psychology there were two librarians who rated the recommendations independently. Interestingly they have chosen the same top 5 journals, yet in different order.

As it can be seen in Figure 8 the accessibility on the journal website, the possibility for authors to self-archive their papers and the reuse rights are much more important for librarians than for authors themselves. Three of four librarians also laid great importance on the Impact Factor. Further the price, either as subscription price or APC was also found to be of average importance.

	Librarian 1 (Aerosol Chem.)	Librarian (Dentistry)	Librarian 3 (Psychology)	Librarian 4 (Psychology)	Total	Mean
Author rights	4	4	4	4	**16**	4
Accessibility on Journal Website	4	4	4	2	**14**	3.5
Impact Factor	4	2	4	4	**14**	3.5
Reuse rights	4	4	2	4	**14**	3.5
APC	3	4	2	4	**13**	3.25
Price of Journal	4	4	2	2	**12**	3
Indexed in PubMed	4	3	2	1	**10**	2.5
Speed of Publication	1	4	1	3	**9**	2.25
Indexed in PsycINFO	2	1	4	1	**8**	2
Journal assigns DOIs	2	1	3	2	**8**	2
Journal is owned by a society/inst.	4	1	2	1	**8**	2
Scimago Journal Rank	4	2	1	1	**8**	2
Peer Review Type	1	3	1	2	**7**	1.75
Publisher	4	1	1	1	**7**	1.75
Traditional Charges	1	1	1	4	**7**	1.75
Number of Reviewers	1	2	1	2	**6**	1.5
Topical Match	1	1	3	1	**6**	1.5
Editorial Board	2	1	1	1	**5**	1.25
Acceptance Rate	1	1	1	1	**4**	1

1 = not at all important, 2 = somewhat important, 3 = important, 4 = very important

Figure 8: Responses Librarian: What was the importance of attributes for your choice?

Funder

As nobody from the funder side took part in the survey, the best ranking was created (see section 4.5.3) according the previously (section 4.1.2) reported requirements. In particular these were:

- *Open access is preferred over closed access and hybrid journals*
- *Low APC, but also low subscription preferred.*
- *Short embargoes (either directly at the publisher or through self-archiving rights) preferred.*

4.5 Generating the algorithm

Attributes that were confirmed by the survey to be significant were converted to numerical scores between 0 and 1. These are in particular:

- *[Pubmed Currently Indexed]*
- *[PsycINFO Indexed Score]*
- *[Journal Uses DOI Score]*
- *[OA Author Rights Score]*
- *[OA Readers Rights Score]*
- *[OA Reuse Rights Score]*
- *[JCR IF Score]*
- *[SCIMAGO SJR Score]*
- *[Journalprices.com Score]*
- *[OA Article Processing Charge Score]*
- *[Journal Average Time from Submission To First Decision Score]*
- *[Journal Average Time From Submission to Final Publication Score]*
- *[Journal Average Time From Submission to Final Decision Acceptance Score]*
- *[JANE Score Normalized]*
- *[Whichjournal Ranking Score]*

The specific conversion rules can be found in Appendix C: Converting attributes to numerical scores.

Some other medium important attributes (like publisher, peer review type, number of reviewers, ownership of the journal, acceptance rate) were not converted into a score as they express an individual preference that hardly can be generalized. However these attributes are good candidates to be included as filter to the results (see section Filters).

The traditional charges were also excluded from the algorithm despite this attribute was explicitly mentioned by a librarian to be very important. Often these charges (like for page excess or color figures) depend on the characteristics of the submitted article and hardly can be assumed to be similar for other submissions. Also it was noted while collecting this data from the journal websites, that charges for color figures (most frequent traditional charge) are often requested by journals that still have print issues. So it's probably just a matter of time until these journals will switch to e-only and most of the charges will become obsolete.

The topical match/fit is represented by the ranking score of JANE and the ranking order of Whichjournal. Actually Whichjournal also offers some kind of matching score (Excellent, Very Good, Weak, Very Weak) but unfortunately the score wasn't captured at the frist data collection. By revisiting the website, Whichjournal obviously has changed their algorithm and different result appeared. Because at that time the experts already had rated the previous set, it was decided proceed with the old ranking of Whichjournal and just taking the order as indicator for the topical fit.

The conversion to numerical scores, the following ranking and evaluation was implemented with the Open Source solution Pentaho Data Integration (PDI)[6] using transformation scenarios (. This approach leaves the original data unmodified and allows the replay of all conversions and rankings at any time.

In the following sections the ranking algorithm is provided in the notation as directly used in PDI as a simple formula step.

4.5.1 Ranking Researcher

To start with an initial algorithm, the average importance from the questionnaire was used as weight. Average values below smaller than 2 (only somewhat important) were ignored:

```
4*([JANE Score Normalized]+[Whichjournal Ranking Score])+3.7*[JCR IF Score]+2.3*[OA Reuse Rights Score]+2.3*[Pubmed Currently Indexed]+2.3*[Journal Uses DOI Score]+2*[OA Article Processing Charge Score]+2*[OA Author Rights Score]+2*(([Journal Average Time from Submission To First Decision Score]+[Journal Average Time From Submission to Final Publication Score]+[Journal Average Time From Submission to Final Decision Acceptance Score])/3)
```

[6] http://sourceforge.net/projects/pentaho/files/Data%20Integration/

4.5.2 Ranking Library

Like the researcher ranking, the average importance from the questionnaire was used as weight. Average values below smaller than 2 were ignored:

*4**[OA Author Rights Score]+*3.5**[OA Readers Rights Score]+*3.5**[JCR IF Score]+*3.5**[OA Reuse Rights Score]**3.25**[OA Article Processing Charge Score]+*3**[Journalprices.com Score]+*2.5**[Pubmed Currently Indexed]+ *2**(([Journal Average Time from Submission To First Decision Score]+[Journal Average Time From Submission to Final Publication Score]+[Journal Average Time From Submission to Final Decision Acceptance Score])/*3*)+*2**[PsycINFO Indexed Score]+*2**[Journal Uses DOI Score]+ *2**[SCIMAGO SJR Score]

4.5.3 Ranking Funder

The following ranking formula was used to reflect the funder's requirement for Open access and low costs.

2*[OA Reuse Rights Score]+2*[OA Readers Rights Score]+[OA Author Rights Score]+[OA Article Processing Charge Score]+[Journalprices.com Score]

4.5.4 Ranking Total (Creating the balance)

Having calculated the ranking score for each stakeholder, all scores were again normalized between 0 and 1. With these normalized values the harmonic mean was calculated. The harmonic mean is always smaller or equal than the arithmetic or geometric mean and tends to the minimum if values differ greatly (Manning, Raghavan, & Schütze, 2008, p. 157). As we want to achieve a good balance of all stakeholder interests, an average that is sensitive to big differences is desirable.

3/(*1*/[Ranking Researcher Score Normalized]+*1*/[Ranking Library Score Normalized]+*1*/[Ranking Funder Score Normalized])

4.6 Evaluate the algorithm

Having calculated an average ranking, the question arises how well this ranking balances the different interests? According to the thesis statement the new ranking should be better correspond to all interests than the ranking of existing systems like Whichjournal.com or JANE.

In order to evaluate and compare the rankings, the **average precision** of each ranking with respect to the expert judgments gained by the online questionnaire can be calculated.

The precision in information retrieval is usually the fraction of retrieved items (Manning et al., 2008, p. 155).

$$Precision = \frac{\#(relevant\ journal\ retrieved)}{\#(retrieved\ journals)}$$

In this case let's say the five best journals as selected by the experts (librarians and researchers) and the best five journals calculated for the funder ranking are the only relevant journals and the remaining journals are regarded as irrelevant for these stakeholders. So in case there the sample contains 20 journals, where as only 5 are relevant the precision is:

$$Precision = \frac{5}{20} = 0.25$$

The goal is to evaluate the ranking, where the precision alone won't help much. If the sample size and the number of relevant journals remain constant, the precision for each ranking will be the same. That is to say for each ranking there are always 5 relevant journals out of 20. To review the ranking too, the average precision can be calculated. The average precision is the mean from the precisions calculated at each rank with a relevant journal. To give an example:

Rank	Journal	Expert Judg.	Precision
1	Dental materials	relevant	Precision = 1/1 =1
2	Clinical Oral Investigations	relevant	Precision = 2/2 = 1
3	Operative Dentistry	not relevant	Precision = 0
4	Journal of Dentistry	not relevant	Precision = 0
5	Dental Materials Journal	relevant	Precision = 3/5 = 0.6
			Average Precision = (1+1+0.6)/5 = 0.52

Table 4: Example how to calculate the average precision

So for each given ranking of journals the average precision can be calculated at any defined rank or for the whole sample.

4.6.1 Average Precision of existing systems

For the comparison of the new algorithm it's important to know how well the existing algorithms of JANE and Whichjournal perform. Therefore we take the five top ranked journals of those two systems and compare it with our expert ratings from researchers and librarians as well for the calculated top five journals of the funder perspective.

Table 5 shows the average precision for all samples. In the table one can find the maximum ranking as well. As the sample size varies, the maximum is dynamic. It's noteworthy, that even for the perfect case, where the top 5 journals from the experts match the top 5 journals from the recommendation system, the average precision remains small. That's simply because the average precision is calculated over the whole sample and even in the best case there are 17 to 26 non relevant journals in the sample.

For the calculation of the average precision the inner order of the top 5 journals selected by the experts is ignored. We regard these top 5 journals as homogenous set for all relevant journals. In the questionnaire the experts had also been asked to score the journals between 1-9. With the exception of two ratings below 4 at the fifth position, all ratings were bigger than 5. So we can conclude that all five journals can be regarded top journals (from the whole sample) and a further differentiation is not needed (although possible).

AVP per discipline	Max	Library		Researcher		Funder	
	Top5/n	**WJ**	**JANE**	**WJ**	**JANE**	**WJ**	**JANE**
Dentistry (n=30)	0.18	0.03	0.08	0.06	0.12	0.03	0.06
Psychology (n=31)	0.16	0.03	0.04	0.07	0.07	0.03	0.02
Aerosol Chemistry 1 (n=22)	0.23	0.06	0.10	0.12	0.06	0.10	0.06
Aerosol Chemistry 2 (n=28)	0.18	-	-	0.02	0.14	0.03	0.05

Table 5: Average precision for the rankings of Whichjournal (WJ) and JANE

Having a closer look at Table 5 we can clearly see that the rankings of JANE and WJ not fit the expert ratings very well, but can be described as moderate. Both rankings are also closer to the researcher perspective than to the library or funder perspective. These results are now the basis for the comparison for the new ranking.

4.6.2 Average Precision of the new created algorithm

Now we run the newly generated algorithm and compute the average precision for each stakeholder. In order to present a complete view, also the partial ranking for each stakeholder are presented in Table 6.

Ranking	**Library**				**Researcher**				**Funder**			
AVP	Lib.	Res.	Fun.	**Total**	Lib.	Res.	Fun.	**Total**	Lib.	Res.	Fun.	**Total**
Dentistry	0.05	0.09	0.06	**0.06**	0.04	0.12	0.03	**0.03**	0.15	0.05	0.17	**0.14**
Psychology	0.15	0.06	0.16	**0.16**	0.02	0.07	0.03	**0.03**	0.14	0.04	0.15	**0.15**

Aerosol Chem. 1	0.10	0.10	0.16	**0.12**	0.04	0.06	0.05	**0.05**	0.13	0.12	0.22	**0.16**
Aerosol Chem. 2	-	-	-	-	0.03	0.05	0.03	**0.03**	0.18	0.09	0.12	**0.13**

Table 6: Average precision of the newly generated algorithm
(For complete data see: http://doi.org/rqc).

The comparison of this new ranking with WJ and JANE shows a significant improvement with regard to the funder and partially for the library perspective (Table 7). Yet, there's also a relevant decline of the average precision for the researcher perspective. When focusing only on the researcher ranking (0.12, 0.07, 0.06, 0.05) it becomes obvious that the partial ranking performs mediocre (but similar like WJ and JANE) with regard to the researcher perspective. However it also shows that the precision was pulled down by the harmonic mean of the overall ranking, where obviously the library and funder ranking were more dominant.

	Library		**Researcher**		**Funder**	
	WJ	JANE	WJ	JANE	WJ	JANE
Dentistry	+0.03	-0.02	-0.03	-0.09	+0.11	+0.08
Psychology	+0.13	+0.12	-0.04	-0.04	+0.12	+0.13
Aerosol Chemistry 1	+0.06	+0.02	-0.07	-0.01	+0.06	+0.1
Aerosol Chemistry 2	-	-	0.01	-0.11	+0.1	+0.08

Table 7: Differences of the new ranking compared with WJ and JANE

To achieve a better inclusion of the researcher ranking in the aggregated score, the weight of the researcher ranking was increased:

(*2**[Ranking Researcher Score Normalized])+(*2*/(*1*/[Ranking Library Score Normalized]+*1*/[Ranking Funder Score Normalized]))

This modification of the aggregated ranking improves the researcher ranking a little bit, but it also drops the precision of the funder and library ranking (Table 8).

	Library	Researcher	Funder
Dentistry	0.08 (+0.02)	0.05 (+0.02)	0.12 (-0.02)
Psychology	0.13 (-0.03)	0.04 (+0.01)	0.11 (-0.04)
Aerosol Chemistry 1	0.11 (-0.01)	0.06 (+0.01)	0.16 (-)
Aerosol Chemistry 2	-	0.03 (-)	0.18 (+0.05)

Table 8: Average Precision of the total ranking, when doubling the Researcher ranking.

With the current ranking however we already can confirm the thesis statement by taking into account that with the new ranking two stakeholders (funder, library) out of three, are happier with the new ranking than with the ranking from JANE or Whichjournal. So the balance has improved. However it would be nice to improve the ranking of the researcher without loosing too much precision of the library and funder ranking.

4.7 Recommendation for the interface

This section addresses the research question "What kind of functionalities like filters or self defined input fields should the journal recommendation systems have?"

Transparency

In the interviews with different stakeholders a general reservation about a recommendation system for journals was recognized. This skepticism seems to be caused by the fear that the selection process of a journal will no longer be in the control of the author alone. Of course the intention of a recommendation system as presented here, is just to give recommendations (which can be ignored after all). It always will be the author who decides where he/she will publish. To stress that condition the recommendation system should be as transparent as possible. Recommendations should be explained, so the user can always see why a journal is at a certain position of a ranking. It shouldn't be a black box. So all the information a journal are presented on a separate page (like the factsheets that were created for the questionnaire: http://doi.org/rnx)

Filters

There should also be a possibility to filter results by the following attributes:

- *Publisher / ownership of the journal*
- *Peer review type / number of reviewers*
- *Acceptance rate*

Discipline specific attributes

The interface should also support the activation of discipline specific attributes, like whether a researcher expects a journal to be included in PubMed or PsycInfo. There's no point to include the information whether a journal is included in PsycInfo into the ranking for disciplines unrelated to psychology or psychiatry. So either the researcher can activate the inclusion or the algorithm can automatically determine the discipline of the current query and in consequence activate the inclusion of these discipline specific attributes in the algorithm.

Manual adjustments to the weights

As the algorithm is based on three partial rankings, it would be interesting to have sliders to see dynamically what happens to the overall score when put different weights on the partial rankings.

Predefintion of article type

Knowing more about the article to be submitted would in certain cases help to determine the right value. Some OA journals charge a different fee for a review than for an original research article.

5 Conclusion

This thesis was motivated to provide an approach to help authors to select a journal that balances several interests, like Impact Factor vs. Open Access, which is a very common need in the real world, especially in the medicine. It has been shown that designing such a recommendation system is in principle possible.

The most difficult part or lets say the most time intensive part was collecting the data from the journals. Some attributes were quite difficult to get, like speed of publication, which in many cases had to be requested from the journal editor directly. In regard to expand the recommendation system to other disciplines, this effort has to be taken into account.

This contribution also showed that the importance of the topical match for authors should not be underestimated. The current approach to use the ranking of JANE and Whichjournal worked quite well, but even for these systems it's hard to grasp the "spirit" of the paper, because the author always has a clearer picture and more information about where it could fit.

For further studies it would be interesting to see how well the new ranking fits to the needs of all stakeholder. Will the recommendation of the system be an acceptable choice for the author? With the current achieved ranking algorithm there's a tradeoff for the author. In order to publish more in consent with the library or funder perspective, the author might have to live with a lesser fit of his interest (like a smaller IF for example). In case this tradeoff is acceptable, there's a good chance in the long-term that the tradeoff becomes smaller. Because the more good contributions go to open journals with a lower IF, the faster the IF is raising. Especially for disciplines, where authors actually are interested in contributing to OA journals, but there are no OA journals that fits the other requirements this could be a very welcomed improvement.

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Appendix A1: Interview Questions Researcher

- *How many papers have you published so far?*
- *How do you choose a journal to publish?*
- *Does the expected kind of peer review process (double blind, open etc.) influence your choice of journal?*

  little (1) (2) (3) (4) (5) much
- *Do you care about the names on the editorial board?*

  little (1) (2) (3) (4) (5) much
- *Does speed of publication influence your choice of journal?*

  little (1) (2) (3) (4) (5) much
- *Does the reported rejection rate influence your choice of journal?*

  little (1) (2) (3) (4) (5) much
- *How important is the impact factor?*

  little (1) (2) (3) (4) (5) much
- *Are there any other journal rankings in your domain?*
- *How import is the topical matching from your paper to the journal scope?*

  little (1) (2) (3) (4) (5) much
- *Are you influenced by the number of subscribers/ readers that a journal reports?*

  little (1) (2) (3) (4) (5) much
- *How important are the technical features of journal or its plattform, regarding layout, web design, linking options of references etc.*

  little (1) (2) (3) (4) (5) much
- *Do you care, in which abstract databases is indexed?*

  little (1) (2) (3) (4) (5) much
- *How much do you care about a subscription price of a journal?*

  little (1) (2) (3) (4) (5) much
- *What is your general attitude towards open access publishing models?*
- *Is publishing in an OA journal an important part of the "where to publish" decision?*

  little (1) (2) (3) (4) (5) much
- *What disincentives are there for you to publish in an OA venue?*
- *Does your University/department make a statement for or against open access publishing?*

- *Does your institution/funder covers the cost for Publication Charges?*
- *In case the journal requires a publication charge for OA, how does this affect your choice of publication?*

Appendix A2: Interview Questions Library

- *Does the library sets any direct or indirect expectations, in which journals researcher should publish?*
- *From your perspective and experience as a librarian:*
    - *Would you like to researcher to prefer certain journals/publishers to others when they publish?*
    - *Should OA be an important part of the "where to publish" decision of researchers?*
    - *Should the Impact Factor be an important part of the "where to publish" decision of researchers?*
    - *Should researchers prefer journals to publish, where they keep more rights regarding self-archiving?*
    - *Should researchers prefer journals to publish, where the subscription price is low.*
    - *Should researchers prefer journals to publish, where the subscription price is low.*
- *What is your general attitude towards open access publishing models?*
- *What disincentives do you see with open access journals?*
- *Does your institution/library make a statement for or against open access publishing?*
- *Does your institution/library cover the cost for OA publication charges?*
- *If so, what are the requirements (publisher, kind of journal, price)?*
- *According to what criteria do you choose to subscribe a journal, in case it's a subscription journal?*
- *According to which aspects do you judge a journal as a good journal?*

Appendix A3: Interview Questions Institution

- *Does the faculty sets any direct or indirect expectations, in which journals their members should publish? (eg. within the research assessment or tenure-track)?*
- *How important is the impact factor?*

  little (1) (2) (3) (4) (5) much

- *Are there any other journal rankings in the domain of your faculty?*
- *Does your faculty make a statement for or against open access publishing?*
- *Should OA be an important part of the "where to publish" decision?*

  little (1) (2) (3) (4) (5) much

- *What disincentives do you see to publish in an OA venue?*
- *Does your faculty covers the cost for Publication Charges?*
- *How important is the peer review process (double blind, open etc.) for the faculty?*

  little (1) (2) (3) (4) (5) much

- *Should the names on the editorial board influence the choice of journal?*

  little (1) (2) (3) (4) (5) much

- *Should the speed of publication influence the choice of journal?*

  little (1) (2) (3) (4) (5) much

- *Should the reported rejection rate influence the choice of journal?*

  little (1) (2) (3) (4) (5) much

- *Should the number of subscribers/ readers influence the choice of journal?*

  little (1) (2) (3) (4) (5) much

- *Should the technical features of a journal or its platform (web design, linking options of references) influence the choice of journal?*

  little (1) (2) (3) (4) (5) much

- *Do you care, in which abstract databases the journals are indexed?*

  little (1) (2) (3) (4) (5) much

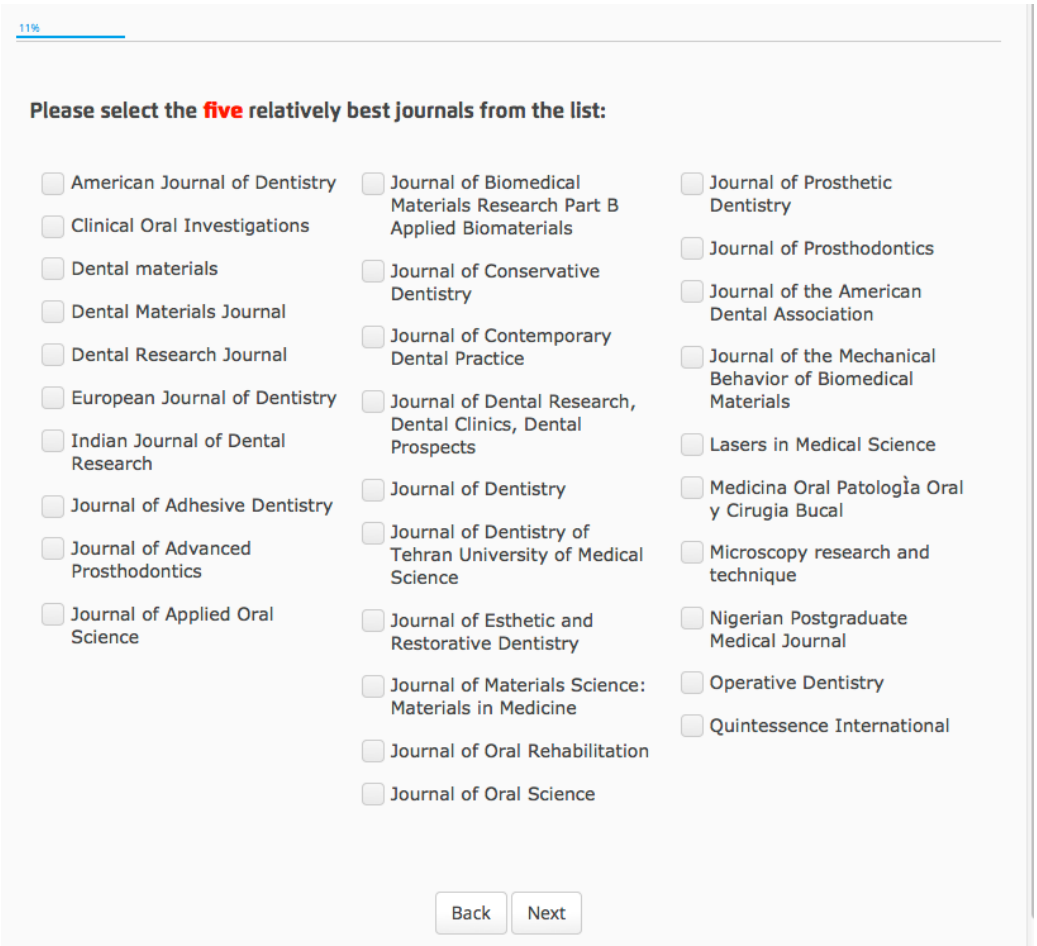
- *How much do you care about a subscription price of a journal?*

  little (1) (2) (3) (4) (5) much

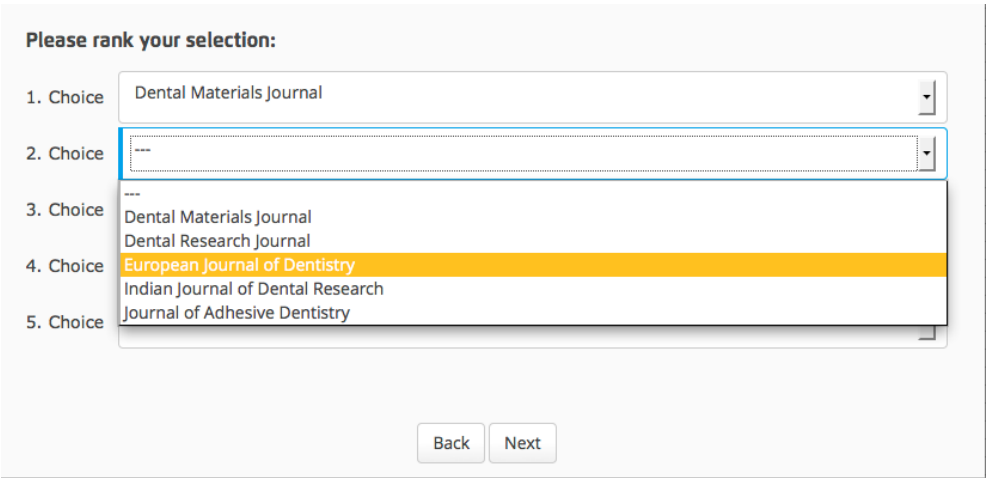
Appendix B: Online Questionnaire

Example for the discipline dentistry.

Question 1:



Question 2:



Question 3:

Please rate *Dental Materials Journal* according to your understanding of a good journal between 1 and 9.

Terrible 5 Perfect

What are the main positive factors that make *Dental Materials Journal* better than all the others?

1. positive factor ---
2. positive factor ---
3. positive factor ---

Please explain briefly why *Dental Materials Journal* is your 1st choice?

Are there any other aspects/factors not yet mentioned?

Type here

Back Next

Question 4-7

Please rate *Dental Research Journal* according to your understanding of a good journal between 1 and 9.

Terrible 5 Perfect

What are the main positive factors that make *Dental Research Journal* better than most others?

1. positive factor ---
2. positive factor ---
3. positive factor ---

What are the main negative factors that make *Dental Research Journal* worse than *Dental Materials Journal*?

1. negative factor ---
2. negative factor ---
3. negative factor ---

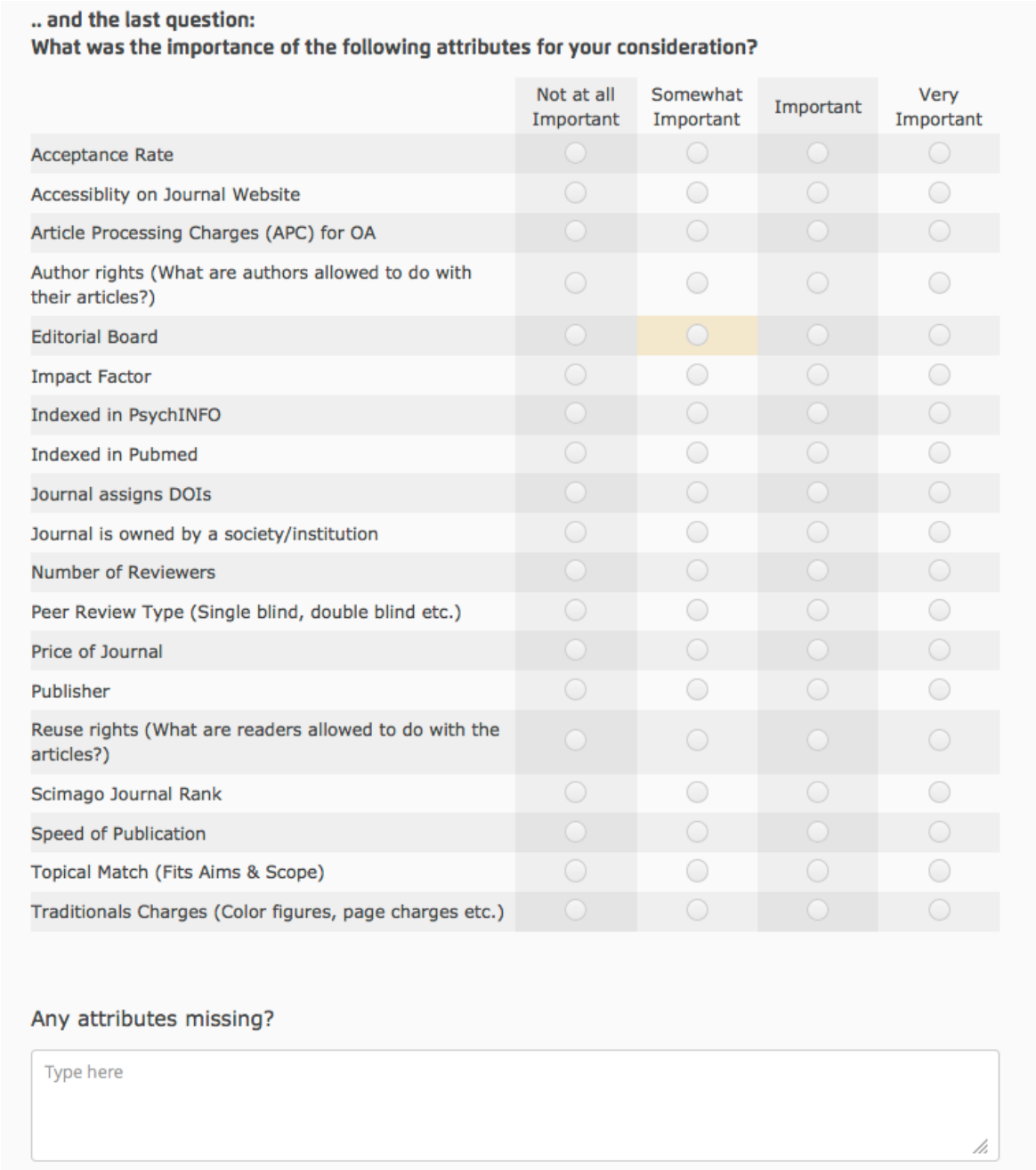
Please explain briefly why *Dental Research Journal* is your 2nd choice?

Are there any other aspects/factors not yet mentioned?

Type here

Question 8

These attributes were predefined as values in the dropdown list for the positive and negative factors in Question 3-7.



.. and the last question:
What was the importance of the following attributes for your consideration?

	Not at all Important	Somewhat Important	Important	Very Important
Acceptance Rate	○	○	○	○
Accessiblity on Journal Website	○	○	○	○
Article Processing Charges (APC) for OA	○	○	○	○
Author rights (What are authors allowed to do with their articles?)	○	○	○	○
Editorial Board	○	○	○	○
Impact Factor	○	○	○	○
Indexed in PsychINFO	○	○	○	○
Indexed in Pubmed	○	○	○	○
Journal assigns DOIs	○	○	○	○
Journal is owned by a society/institution	○	○	○	○
Number of Reviewers	○	○	○	○
Peer Review Type (Single blind, double blind etc.)	○	○	○	○
Price of Journal	○	○	○	○
Publisher	○	○	○	○
Reuse rights (What are readers allowed to do with the articles?)	○	○	○	○
Scimago Journal Rank	○	○	○	○
Speed of Publication	○	○	○	○
Topical Match (Fits Aims & Scope)	○	○	○	○
Traditionals Charges (Color figures, page charges etc.)	○	○	○	○

Any attributes missing?

Type here

Appendix C: Converting attributes to numerical scores

Pubmed [Pubmed Currently Indexed]

Currently indexed	1
Not Indexed	0

PsycINFO [PsycINFO Indexed Score]

Currently indexed	1
Not Indexed	0

DOI [Journal Uses DOI Score]

Journal assigns Digital Object Identifiers (DOI)	1
Journal does not assign Digital Object Identifiers (DOI)	0

Author Rights [OA Author Rights Score]

6.1 Author may post PUBLISHED VERSION to ANY repositories or websites immediately	1
6.2 Author may post PUBLISHED VERSION to ANY repositories or websites with embargo of 6 months or less	0.8
6.3 Author may post PUBLISHED VERSION to ANY repositories or websites with embargo more 6 months	0.75
5.1 Author may post PUBLISHED VERSION to CERTAIN repositories or websites immediately	0.8
5.2 Author may post PUBLISHED VERSION to CERTAIN repositories or websites with embargo of 6 months or less	0.75
5.3 Author may post PUBLISHED VERSION to CERTIAN repositories or websites with embargo more 6 months	0.7
4.1 Author may post POSTPRINT of the peer-reviewed manuscript to ANY repositories or websites immediately	0.6
4.2 Author may post POSTPRINT of the peer-reviewed manuscript to ANY repositories or websites with embargo of 6 months or less	0.5
4.3 Author may post POSTPRINT of the peer-reviewed manuscript to ANY repositories or websites with embargo more 6 months	0.4
3.1 Author may post POSTPRINT of the peer-reviewed manuscript to CERTAIN repositories or websites immediately	0.5
3.2 Author may post POSTPRINT of the peer-reviewed manuscript to CERTAIN repositories or websites with embargo of 6 months or less	0.4
3.3 Author may post POSTPRINT of the peer-reviewed manuscript to CERTIAN repositories or websites with embargo more 6 months	0.3
2. Author may post Preprint to certain repositories or websites	0.2
1. Author may not deposit any version to repositories or websites	0

0. Unknown	0

Accessibility [OA Readers Rights Score]

Free readership rights to all articles immediately upon publication.	1
Free readership rights to all articles after 6 months or less.	0.75
Free readership rights to all articles after 6 months or more.	0.5
Free and immediate readership right to some, but not all, articles (including "hybrid").	0.2
Subscription, membership, pay-per-view, or other fees required to read all articles.	0

Reuse Rights [OA Reuse Rights Score]

CC-BY	1
CC-BY-NC or CC-BY-SA	0.75
CC-BY-ND	0.5
No reuse right beyond fair use	0

Impact Factor (IF) [JCR IF Score]

Impact Factor recalculated according the best IF in the sample: $\frac{IF}{IF\ Maximum}$	Between 0 and 1

SCIMago Journal Rank (SJR) [SCIMAGO SJR Score]

SCIMago Journal Rank recalculated according the best SJR in the sample: $\frac{SJR}{SJR\ Maximum}$	Between 0 and 1

Journal Prices [Journalprices.com Score]

Journalprices.com categorization: good (includes OA journals)	1
Journalprices.com categorization: medium (Includes Closed Access and Hybrid journals were no data is available)	0.5
Journalprices.com categorization: bad	0

Article Processing Charge (APC) [OA Article Processing Charge Score]

$1 - \left(\frac{APC}{3000}\right)$ Any APC equal or bigger than $3000 results in 0	Between 0 and 1

Speed of publication 1 [Journal Average Time from Submission To First Decision Score]

Fastest (top 10^{th} percentile of the sample)	1
Fast (10^{th}-20^{th} percentile of the sample)	0.75
Average (20^{th} – 80^{th} percentile of the sample). Includes journals where no data is available and therefore the median of the existing values was taken.	0.5

Slow (80th- 90th percentile of the sample)	0.25
Slowest (90th percentile of the sample)	0

Speed of publication 2 [Journal Average Time From Submission to Final Decision Acceptance Score]

Fastest (top 10th percentile of the sample)	1
Fast (10th-20th percentile of the sample)	0.75
Average (20th – 80th percentile of the sample). Includes journals where no data is available and therefore the median of the existing values was taken.	0.5
Slow (80th- 90th percentile of the sample)	0.25
Slowest (90th percentile of the sample)	0

Speed of publication 3 [Journal Average Time From Submission to Final Publication Score]

Fastest (top 10th percentile of the sample)	1
Fast (10th-20th percentile of the sample)	0.75
Average (20th – 80th percentile of the sample). Includes journals where no data is available and therefore the median of the existing values was taken.	0.5
Slow (80th- 90th percentile of the sample)	0.25
Slowest (90th percentile of the sample)	0

JANE Score [JANE Score Normalized]

JANE score recalculated according the best in the sample: $$JANE\ Score\ Normalized = \frac{JANE\ Score}{JANE\ Score\ Maximum}$$	Between 0 and 1

Whichjournal Ranking [Whichjournal Ranking Score]

Rank in the Whichjournal Ranking recalculated according the best in the sample: $$Whichjournal\ Ranking\ Score = \frac{Reverted\ Rank\ in\ Whichjournal\ Ranking}{Ranking\ Whichjournal\ Maxium}$$	Between 0 and 1